What is claimed is:

1. An apparatus for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging instrument comprising an acoustic transmitter for transmitting acoustic signals into the formations surrounding said earth borehole, an acoustic receiver for receiving acoustic signals returning from said formations and for receiving acoustic noise signals, an acoustic sensor responsive only to acoustic noise signals, to the exclusion of the acoustic signals returning from said formations, and an electronic processor in said instrument for combining the signals received by said acoustic receiver and by said acoustic sensor to produce signals substantially free of said acoustic noise signals.

2. The apparatus according to Claim 1, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received acoustic noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of said acoustic noise signals.

3. The apparatus according to Claim 2, comprising circuitry for generating a propagation factor relating to the propagation of acoustic signals between said acoustic receiver and said acoustic sensor, and for modifying the acoustic noise signals based upon said propagation factor prior to being combined with the acoustic signals returning from the earth formations to produce signals substantially free of said acoustic noise signals.

4. An apparatus for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging instrument comprising an acoustic transmitter for transmitting acoustic signals into the formations surrounding said earth borehole, at least two acoustic receivers for receiving acoustic signals returning from said formation and for receiving acoustic noise signals, an acoustic sensor responsive only to acoustic noise signals, to the exclusion of the acoustic signals returning from said formations, and an electronic processor in said instrument for combining the signals received by said acoustic receivers and by said acoustic sensor to produce signals substantially free of said acoustic noise signals.

5. The apparatus according to Claim 4, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received acoustic noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of said acoustic noise signals.

6. The apparatus according to Claim 5, comprising circuitry for generating one or more propagation factors relating to the propagation of acoustic signals between said acoustic receivers and said acoustic sensor, and for modifying the acoustic noise signals based upon said propagation factors prior to being combined with the acoustic signals returning from the earth formation to produce signals substantially free of said acoustic noise signals.

7. An apparatus for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging

instrument comprising an acoustic transmitter for transmitting acoustic signals into the formations surrounding said earth borehole, at least two acoustic receivers for receiving acoustic signals returning from said formation and for receiving acoustic noise signals, at least two acoustic sensors responsive only to acoustic noise signals, to the exclusion of the acoustic signals returning from said formations, and an electronic processor in said instrument for combining the signals received by said acoustic receivers and by said acoustic sensors to produce signals substantially free of said acoustic noise signals.

8. The apparatus according to Claim 7, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received acoustic noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of said acoustic noise signals.

9. The apparatus according to Claim 8, comprising circuitry for generating one or more propagation factors relating to the propagation of acoustic signals between said acoustic receivers and said acoustic sensors, and for modifying the acoustic noise signals based upon said propagation factors prior to being combined with the acoustic signals returning from the earth formation to produce signals substantially free of said acoustic noise signals.

10. The apparatus according to Claim 7, wherein each of said acoustic sensors is positioned within said logging instrument to detect noise signals propagating towards the said sensors.

11. The apparatus according to Claim 7, wherein at least one of said acoustic sensors is positioned to detect a noise signal propagating from above and toward the one

sensor, and at least another of said acoustic sensors is positioned to detect a noise signal propagating from below and toward the one sensor.

12. An apparatus for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging instrument comprising an acoustic transmitter for transmitting acoustic signals into the formations surrounding said earth borehole, an acoustic receiver for receiving acoustic signals returning from said formation and for receiving acoustic noise signals, at least two acoustic sensors responsive only to acoustic noise signals, to the exclusion of the acoustic signals returning from said formations, and an electronic processor in said instrument for combining the signals received by said acoustic receivers and by said acoustic sensors to produce signals substantially free of said acoustic noise signals.

13. The apparatus according to Claim 12, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received acoustic noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of said acoustic noise signals.

14. The apparatus according to Claim 13, comprising circuitry for generating one or more propagation factors relating to the propagation of acoustic signals between said acoustic receiver and said acoustic sensors, and for modifying the acoustic noise signals based upon said propagation factors prior to being combined with the acoustic signals returning from the earth formation to produce signals substantially free of said acoustic noise signals.

15. An apparatus for conducting acoustic caliper measurements of an earth formation borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging instrument comprising an acoustic transmitter for transmitting acoustic signals into said earth formation borehole, an acoustic receiver for receiving acoustic signals returning from the borehole wall and for receiving acoustic noise signals, an acoustic sensor responsive only to acoustic noise signals, to the exclusion of the acoustic signals returning from said borehole wall, and an electronic processor in said instrument for combining the signals received by said acoustic receiver and by said acoustic sensor to produce signals substantially free of said acoustic noise signals.

16. The apparatus according to Claim 15, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received acoustic noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of said acoustic noise signals.

17. The apparatus according to Claim 16, comprising circuitry for generating a propagation factor relating to the propagation of acoustic signals between said acoustic receiver and said acoustic sensor, and for modifying the acoustic noise signals based upon said propagation factor prior to being combined with the acoustic signals returning from the earth formation to produce signals substantially free of said acoustic noise signals.

18. An apparatus for conducting acoustic caliper measurements of an earth formation borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging

instrument comprising an acoustic transmitter for transmitting acoustic signals into said earth formation borehole, an acoustic receiver for receiving acoustic signals returning from the borehole wall and for receiving acoustic noise signals, at least two acoustic sensors responsive only to acoustic noise signals, to the exclusion of the acoustic signals returning from said borehole wall, and an electronic processor in said instrument for combining the signals received by said acoustic receiver and by said acoustic sensors to produce signals substantially free of said acoustic noise signals.

19. The apparatus according to Claim 18, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received acoustic noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of said acoustic noise signals.

20. The apparatus according to Claim 19, comprising circuitry for generating one or more propagation factors relating to the propagation of acoustic signals between said acoustic receiver and said acoustic sensors, and for modifying the acoustic noise signals based upon said propagation factors prior to being combined with the acoustic signals returning from the earth formation to produce signals substantially free of said acoustic noise signals.

21. A method for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

positioning an acoustic well logging instrument in a drillstring adjacent an earth formation to be logged;

transmitting acoustic signals into said earth formation;

receiving at a first location in said instrument acoustic signals returning from said earth formation, combined with acoustic noise signals;

detecting acoustic noise signals at a second location in said instrument not combined with said acoustic signals returning from said earth formation; and

processing said acoustic signals received at said first location with the acoustic signals received at said second location to produce acoustic signals substantially free of acoustic noise signals.

22. The method according to Claim 21, wherein said noise signals are in the form of compressional wave noise that propagates along and through the well logging instrument.

23. The method according to Claim 21, wherein the noise signals are in the form of noise from torsional waves that propagates along and through the well logging instrument.

24. The method according to Claim 21, wherein the noise signals are in the form of noise from lateral waves that propagates along and through the well logging instrument.

25. The method according to Claim 21, wherein the noise signals are in the form of noise from precessional movement and random vibration of the well logging instrument.

26. The method according to Claim 21, wherein the source of the noise signal is a drill bit connected in the drill string below the well logging instrument.

27. A method for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

positioning an acoustic well logging instrument in a drillstring adjacent an earth formation to be logged;

transmitting acoustic signals into said earth formation;

receiving at first and second locations in said instrument acoustic signals returning from said earth formation, combined with acoustic noise signals;

detecting acoustic noise signals at a third location in said instrument not combined with said acoustic signals returning from said earth formation; and

processing said acoustic signals received at said first and second locations with the acoustic signals received at said third location to produce acoustic signals substantially free of acoustic noise signals.

28. A method for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

positioning an acoustic well logging instrument in a drillstring adjacent an earth formation to be logged;

transmitting acoustic signals into said earth formation;

receiving at first and second locations in said instrument acoustic signals returning from said earth formation, combined with acoustic noise signals;

detecting acoustic noise signals at third and fourth locations in said instrument not combined with said acoustic signals returning from said earth formation; and

processing said acoustic signals received at said first and second locations with the acoustic signals received at said third and fourth locations to produce acoustic signals substantially free of acoustic noise signals.

29. A method for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

positioning an acoustic well logging instrument in a drillstring adjacent an earth formation to be logged;

transmitting acoustic signals into said earth formation;

receiving at a first location in said instrument acoustic signals returning from said earth formation, combined with acoustic noise signals;

detecting acoustic noise signals at second and third locations in said instrument not combined with said acoustic signals returning from said earth formation; and

processing said acoustic signals received at said first location with the acoustic signals received at said second and third locations to produce acoustic signals substantially free of acoustic noise signals.

30. An apparatus for conducting acoustic logging measurements of formation surrounding an earth borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging instrument comprising an acoustic transmitter for transmitting acoustic signals into the formations surrounding said earth borehole, an acoustic receiver for receiving acoustic signals returning from said formations and which may also respond to noise signals, one or more sensors responsive only to noise signals, to the exclusion of the acoustic signals returning from said formations, and an electronic processor in said instrument for combining the signals received by said acoustic receiver and by said noise sensor to produce signals substantially free of the influences of said noise signals.

31. The apparatus according to Claim 30, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received acoustic noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of the influences of said noise signals.

32. The apparatus according to Claim 31, comprising circuitry for generating a propagation factor relating to the propagation of noise signals between said noise sensor and said acoustic receiver, and for modifying the noise signals based upon said propagation factor prior to being combined with the acoustic signals returning from the earth formations to produce signals substantially free of the influences of said noise signals.

33. An apparatus for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging instrument comprising an acoustic transmitter for transmitting acoustic signals into the formations surrounding said earth borehole, at least two acoustic

receivers for receiving acoustic signals returning from said formation and which may also respond to noise signals, one or more sensors responsive only to noise signals, to the exclusion of the acoustic signals returning from said formations, and an electronic processor in said instrument for combining the signals received by said acoustic receivers and by said noise sensor to produce signals substantially free of the influences of said noise signals.

34. The apparatus according to Claim 33, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received acoustic noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of the influence of said noise signals.

35. The apparatus according to Claim 34, comprising circuitry for generating one or more propagation factors relating to the propagation of noise signals between said noise sensors and said acoustic receiver, and for modifying the noise signals based upon said propagation factors prior to being combined with the acoustic signals returning from the earth formation to produce signals substantially free of the said influences of noise signals.

36. An apparatus for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging instrument comprising an acoustic transmitter for transmitting acoustic signals into the formations surrounding said earth borehole, at least two acoustic receivers for receiving acoustic signals returning from said formation and which may also respond to noise signals, at least two sensors responsive only to noise signals, to the exclusion of the acoustic signals returning from said formations, and an electronic processor in said instrument for combining the signals received by said noise sensors and by said acoustic receivers to produce signals substantially free of the influences of said noise signals.

37. The apparatus according to Claim 36, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of the influences of said noise signals.

38. The apparatus according to Claim 37, comprising circuitry for generating one or more propagation factors relating to the propagation of noise signals between said noise sensors and said acoustic receivers, and for modifying the noise signals based upon said propagation factors prior to being combined with the acoustic signals returning from the earth formation to produce signals substantially free of the influences of said noise signals.

39. The apparatus according to Claim 38, wherein each of said noise sensors is positioned within said logging instrument to detect noise signals propagating towards the said sensors.

40. The apparatus according to Claim 38, wherein at least one of said noise sensors is positioned to detect a noise signal propagating from above and toward the one acoustic sensor, and at least another of said noise sensors is positioned to detect a noise signal propagating from below and toward the one acoustic sensor.

41. An apparatus for conducting acoustic logging measurements of formations surrounding an earth borehole, comprising:

an acoustic logging instrument having first and second threaded ends for threadedly connecting said instrument into a drillstring used for drilling earth boreholes, said logging instrument comprising an acoustic transmitter for transmitting acoustic signals into the formations surrounding said earth borehole, an acoustic receiver receiving acoustic signals returning from said formation and which may also receive noise signals, at at least two sensors responsive only to noise signals, to the exclusion of the acoustic signals returning from said formations, and an electronic processor in said instrument for combining the signals received by said acoustic receivers and by said noise sensors to produce signals substantially free

of the influence of said noise signals.

42. The apparatus according to Claim 41, wherein said electronic processor comprises an analog-to-digital converter and said received acoustic signals returning from the earth formation and said received noise signals are converted from analog to digital form prior to being combined to produce signals substantially free of the influence of said noise signals.

43. The apparatus according to Claim 42, comprising circuitry for generating one or more propagation factors relating to the propagation of acoustic signals between said noise sensors and said acoustic receiver, and for modifying the noise signals based upon said propagation factors prior to being combined with the acoustic signals returning from the earth formation to produce signals substantially free of the influence of said noise signals.